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(54) Pump and pump outlet nozzle

Pumpe und Pumpenauslassöffnung

Pompe et buse de sortie de pompe

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(73) Proprietor: **Sara Lee/DE N.V.**
3532 AA Utrecht (NL)

(72) Inventor: **Sperna Weiland, Jan Adolf Ernst**
7419 AA Deventer (NL)

(74) Representative:
Smulders, Theodorus A.H.J., Ir. et al
Vereenigde
Postbus 87930
2508 DH Den Haag (NL)

(56) References cited:
EP-A- 0 758 615
DE-U- 7 425 331
GB-A- 966 137
US-A- 4 728 009
US-A- 5 429 275
EP-A- 0 794 126
FR-A- 2 643 338
US-A- 3 248 022
US-A- 5 186 368

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Description

[0001] This invention relates to a pump for dispensing a liquid, comprising an inlet) for pumping the liquid, an outlet nozzle and a liquid flow path extending from the inlet to the outlet nozzle for dispensing the pumped liquid via the outlet nozzle, wherein the outlet nozzle comprises an outflow opening which includes an outlet valve, the outlet valve being formed by a valve wall made of a flexible material, which, in a rest position, closes the outflow opening, the valve wall comprising at least three cuts provided in the configuration of a star, each extending from a common point of the valve wall in a radial direction of the outflow opening.

[0002] This invention also relates to an outlet nozzle for dispensing a liquid comprising an outflow opening which includes an outlet valve, the outlet valve being formed by a valve wall made of a flexible material which, in a rest position, closes the outflow opening, the valve wall comprising at least three cuts provided in the configuration of a star, each extending from a common point of the valve wall in a radial direction of the outflow opening.

[0003] Such a pump and nozzle are known from US 5,186,368 and are typically used for dispensing viscous liquids, such as coffee or lemonade extract which is to be diluted with a base liquid such as water for obtaining a beverage suitable for consumption. When dispensing liquid, the outflow openings formed at the cuts between the valve subwalls form a liquid jet whose form and direction are at least substantially stable. After the pumped liquid has been dispensed, the valve subwalls return to the rest position and close off the outflow opening immediately, thereby preventing after-drip. In the known system the opening of the valve is realised by the pressure of the liquid. A disadvantage of this known system is that the pressure is not always sufficient for positively opening of the valve, especially if the sides of the slit stick together (the liquid has dried up in the slit.

[0004] The object of the invention is to provide a solution to the problems outlined. Accordingly, the invention is characterized in that the pump further comprising an outlet valve energization element for pressing valve subwalls, formed between the cuts of the valve wall, from an inside of the outlet nozzle adjacent to the valve wall in a downstream direction of the outlet nozzle, so that said valve subwalls are bent in the downstream direction and at the cuts between the valve subwalls flow passages are formed for opening the outflow opening for dispensing the pumped liquid, while the valve subwalls spring back to the rest position and close the outflow opening) again when the outlet valve energization element is moved back in a direction opposite to the downstream direction. Due to the valve energization element the opening of the valve for dispensing liquid is more reliable.

[0005] In particular, the pump is characterized in that the valve wall in the rest position has a round surface on the inside of the outlet nozzle adjacent to the valve wall. By virtue of this feature, the closure of the outflow opening in the rest position has been found to be optimally reliable.

[0006] Preferably, the common point is located at least substantially in the center of gravity of the valve wall.

[0007] More particularly, the valve wall is provided with four cuts. Preferably, adjacent cuts include an at least substantially right angle. In that case, the cuts in combination form a cross.

[0008] According to a preferred embodiment, the pump further comprises means for moving the outlet valve energization element in downstream direction when the pump dispenses liquid. What is thus accomplished is that the opening and closing of the outlet valve are always synchronized with the dispensing of the pumped liquid.

[0009] According to a particular embodiment, the pump is designed as a metering pump for dispensing an amount of liquid in a metered manner upon an energization of the pump. Such a pump is suitable in particular for dispensing a liquid extract, such as the above-mentioned coffee or lemonade extract. In this way, it can be accurately determined how much coffee or lemonade extract is to be dispensed for preparing a beverage suitable for consumption.

[0010] According to a further elaboration, the pump designed as a metering pump further comprises a cylinder chamber and a plunger which is accommodated in the cylinder chamber for movement between a first position and a second position, the plunger being connected to the outlet valve energization element, the liquid flow path of the pump extending from the inlet to the cylinder chamber and from the cylinder chamber to the outlet nozzle, while for dispensing the pumped liquid contained in the cylinder chamber in a metered manner, the plunger is moved in a direction from the second position to the first position; upon movement of the plunger in the direction from the second position to the first position, the outlet valve energization element causes the valve subwalls to bend from the rest position, so that the outflow opening is opened for dispensing the pumped liquid from the cylinder chamber; upon movement of the plunger in a direction from the first position to the second position, liquid is pumped via the inlet to the cylinder chamber; and upon movement of the plunger from the first position to the second position, the outlet valve energization element is moved back in the direction opposite to the downstream direction, so that the valve subwalls spring back into the rest position and close the outflow opening again. Here, the pump may further comprise setting means for setting a setting position located between the first

and second position, while the plunger can be moved relative to the cylinder chamber from the second extreme position to the setting position. The outlet nozzle according to the invention is characterized in that,

the nozzle further comprising an outlet valve energization element for pressing valve subwalls, formed between the cuts of the valve wall, from an inside of the outlet nozzle adjacent to the valve wall in a downstream direction of the outlet nozzle, so that said valve subwalls are bent in the downstream direction and at the cuts between the valve subwalls flow passages are formed for opening the outflow opening for dispensing the liquid, while the valve subwalls spring back to the rest position and close the outflow opening again when the outlet valve energization element is moved back in a direction opposite to the downstream direction.

[0011] The invention will presently be explained with reference to the drawings, wherein:

Fig. 1 is a perspective view of a possible embodiment of a pump according to the invention;
Fig. 2 is a view of the pump according to Fig. 1 in the direction of the arrow P of Fig. 1;
Fig. 3 is a cross section of the pump of Fig. 1, along line A-A in Fig. 2, with the pump in an initial position;
Fig. 4 is a cross section of the pump of Fig. 1, along line A-A in Fig. 2, where a plunger of the pump has just started moving for dispensing liquid;
Fig. 5 is a cross section of the pump of Fig. 1, along line A-A in Fig. 2, where the plunger has been moved further with respect to Fig. 4;
Fig. 6 is a cross section of the pump of Fig. 1, along line A-A in Fig. 2, where the plunger has been moved into an extreme position and the liquid has been dispensed;
Fig. 7 is a cross section of the pump of Fig. 1, along line A-A in Fig. 2, where the plunger is moving back to its original position and liquid is being drawn in by the pump;
Fig. 8 shows the outlet nozzle of the pump according to Figs. 1-7;
Fig. 9 shows a first alternative embodiment of the outlet nozzle of the pump of Figs. 1-7;
Fig. 10 shows a second alternative embodiment of the outlet nozzle of the pump according to Figs. 1-7; and
Fig. 11 is a front view of the pump device according to Fig. 1, with the pump in the position according to Fig. 6.

[0012] Referring to Figs. 1-8 and Fig. 11, hereinafter a possible embodiment of a pump 1 according to the invention will be described. In this example, the pump is designed as a metering pump for dispensing an amount of liquid in a metered manner upon energization of the pump.

[0013] The pump 1 comprises a housing 2. In a front section 4 of the housing 2 a cylinder chamber 6 is provided. In the cylinder chamber 6, a plunger 8 is accommodated for reciprocation. The cylinder chamber 6 further extends into a space 9 formed in the plunger 8.

[0014] The pump further comprises an inlet 10 which is in fluid communication with the cylinder chamber 6 via a first non-return valve 14. In addition, the cylinder chamber 6 is in fluid communication with an outlet nozzle 12 via a second non-return valve 16.

[0015] The plunger is accommodated in the cylinder chamber for movement between a first extreme position I, indicated in Fig. 3, and a second extreme position II. A liquid flow path of the pump extends from the inlet 10 via the cylinder chamber 6 to the outlet nozzle 12. The first and second non-return valve 14, 16 allow liquid to pass only in the downstream direction of the liquid flow path, that is, in the direction from the inlet 10 to the outlet nozzle 12.

[0016] The outlet nozzle 12 comprises an outflow opening 20 which includes an outlet valve 18. The outlet valve 18 is formed by a valve wall 22 made of a flexible material and connected with the rest of the outlet nozzle. In a rest position as shown in Figs. 1, 2 and 3, the valve wall closes off the outflow opening 20. In this example, the valve wall is in this rest position when the pump is in the second position referred to. The valve wall is provided with at least three, and in this example four, cuts 24 arranged in the configuration of a star (see Fig. 8), each extending from a common point 26 of the valve wall 22 in a radial direction of the outflow opening 22. In the rest position, the valve wall has a round surface on the inside 28 of the outlet nozzle, adjacent to the valve wall. (See Fig. 3).

[0017] The pump further comprises an outlet valve energization element 30 which, in this example, is connected to the plunger 8. In this example, this connection is a rigid mechanical connection. The outlet valve energization element 30 is arranged for pressing the valve subwalls 32 formed between the cuts 24 of the valve wall 22 from the inside 28 of the outlet nozzle 12, adjacent to the valve wall, in the downstream direction of the outlet nozzle, so that these valve subwalls are bent in the downstream direction and flow passages 34 (see Fig. 6) are formed at the cuts between the valve subwalls, for opening the outflow opening for dispensing liquid.

[0018] The valve subwalls have the property of springing back to the rest position, as shown in Fig. 3, when the outlet valve energization element is moved back in a direction opposite to the downstream direction. In this rest position, the valve subwalls 32 will close off the outflow opening again.

[0019] In the rest position as shown in Fig. 3, the edges 36 of the valve subwalls 36 adjacent to the cuts are disposed against each other and thereby close off the outflow opening properly. Adjacent cuts include an at least substantially perpendicular angle φ.

[0020] The operation of the apparatus is as follows. The starting-point is that the plunger is in the second extreme position and that the valve subwalls are in the rest position, as shown in Fig. 3. The cylinder chamber 6 is filled completely with a viscous liquid. In this example, the inlet 10 of the pump is connected with a reservoir

38, schematically shown in Fig. 3, which is filled entirely with a viscous liquid such as a coffee extract or a lemonade extract. The plunger is now moved in the direction from the second position to the first position. This situation is shown in Fig. 4. It further appears from Fig. 4 that the plunger forms means for moving the outlet valve energization element in downstream direction when the pump is energized for dispensing the liquid. As the plunger is moved in the direction from the second to the first position, the volume of the cylinder chamber 6 will decrease. As a consequence, the liquid contained in the cylinder chamber 6 is forced via the second non-return valve 16 into the outlet nozzle 12, while the first non-return valve 14 remains closed and prevents liquid flowing from the cylinder chamber 6 to the inlet 10.

[0021] The outlet valve energization element will start to push from the inside 28 against the round side of the valve wall 22. This is also shown in Fig. 4. Upon further movement of the plunger in the direction of the first position, the outlet valve energization element 30 will bend the valve subwalls 32 in the downstream direction, so that flow passages 34 are formed at the cuts 24 between the valve subwalls 32, for opening the outflow opening 20. This situation is shown in Fig. 5. Simultaneously, the plunger 8 will force liquid from the cylinder chamber 6 to the outlet nozzle 12. This liquid then leaves the outlet nozzle 12 via the flow passages 34. These flow passages 34 ensure that the form and the direction of the jet is constant and predetermined. Upon further movement of the plunger, the cylinder chamber 6 is thus at least substantially emptied. This situation is shown in Fig. 6.

[0022] Then the plunger 8 is moved in the direction from the first to the second position. This situation is shown in Fig. 7. Two things occur here.

[0023] First, the second non-return valve 16 will close, so that no air can flow from the outlet nozzle 12 to the cylinder chamber 6. This creates a reduced pressure in the cylinder chamber 6, causing the cylinder chamber 6 to fill up with liquid from the liquid reservoir 38 via the inlet 10. In other words, liquid is pumped from the liquid reservoir 38. Eventually, the cylinder chamber 6 will be filled completely filled with liquid. The non-return valve 14 will open for the cylinder chamber 6 to be filled.

[0024] Thereupon, simultaneously with the plunger returning in the direction from the first position to the second position, the outlet valve energization element 30 will be moved in a direction opposite to the downstream direction. As a result, the valve subwalls 32 spring back into the rest position referred to earlier. The valve subwalls then close off the outflow opening again. The result is that the outlet nozzle 12, after the liquid has been dispensed as described hereinbefore, will not exhibit any after-drip.

[0025] Of course, the pump may further comprise a spring element which presses the plunger in the direction from the first to the second position, as is also discussed in Dutch patent NL-C- 1003894, further referred to hereinbelow.

[0026] In this example, the common point 26 is located at least substantially in the center of gravity of the valve wall. It is also conceivable, however, that the common point is located at a position different from the center of gravity.

[0027] It is also possible that the valve wall is provided with, for instance, three, instead of four, cuts 24, as shown in Fig. 9. The angle φ here equals approximately 120°. Preferably, adjacent cuts mutually include an at least substantially equal angle. Of course, it is also possible for the valve wall 22 to comprise more than four cuts, such as for instance, six cuts, as shown in Fig. 10. The operation of the valve walls as shown in Figs. 9 and 10, however, is entirely analogous to that of the valve wall of Figs. 1-8.

[0028] Preferably, the valve wall as shown in Figs. 1-8 is directed at least substantially perpendicularly to a flow direction 40 (see Fig. 5) at the outflow opening 20 of the liquid flow path extending through the outflow opening.

[0029] In this example, the outlet nozzle 12 is detachably connected with the remainder of the pump 1 and may therefore be easily removed, for instance to be cleaned.

[0030] The pump as described in the foregoing figures can be used advantageously in an extract manual dispenser as described in NL-C-1003894. The pump of the present patent application then corresponds to the metering pump of NR-C-1003894.

Claims

1. A pump (1) for dispensing a liquid, comprising an inlet (10) for pumping the liquid, an outlet nozzle (12) and a liquid flow path extending from the inlet (10) to the outlet nozzle (12) for dispensing the pumped liquid via the outlet nozzle (12), wherein the outlet nozzle (12) comprises an outflow opening (20) which includes an outlet valve (18), the outlet valve (18) being formed by a valve wall (22) made of a flexible material, which, in a rest position, closes the outflow opening (20), the valve wall (22) comprising at least three cuts (24) provided in the configuration of a star, each extending from a common point (26) of the valve wall (22) in a radial direction of the outflow opening (20), **characterized in that** the pump (11) further comprises an outlet valve energization element (30) for pressing valve subwalls (32), formed between the cuts (24) of the valve wall (22), from an inside (28) of the outlet nozzle (12) adjacent to the valve wall (22) in a downstream direction of the outlet nozzle (12), so that said valve subwalls (32) are bent in the downstream direction and at the cuts between the valve subwalls (32) flow passages are formed for opening the outflow opening (20) for dispensing the pumped liquid, while the valve subwalls (32) spring back to the rest position and close the outflow opening (20) again when the

outlet valve energization element (30) is moved back in a direction opposite to the downstream direction.

2. A pump (1) according to claim 1, **characterized in that** the valve wall (22) in the rest position has a round surface on the inside (28) of the outlet nozzle (12) adjacent to the valve wall (22).

3. A pump (1) according to claim 1 or 2, **characterized in that** edges of the valve subwalls (32) adjacent to the cuts (24) are disposed against each other in the rest position.

4. A pump (1) according to any one of the preceding claims, **characterized in that** the common point (26) is located at least substantially in the center of gravity of the valve wall (22).

5. A pump (1) according to any one of the preceding claims, **characterized in that** the valve wall (22) is directed at least substantially perpendicularly to a direction of flow at the outflow opening (20) of the liquid flow path extending through the outflow opening (20).

6. A pump (1) according to any one of the preceding claims, **characterized in that** the pump further comprises means for moving the outlet valve energization element (30) in downstream direction when the pump (1) is energized for dispensing liquid.

7. A pump (1) according to any one of the preceding claims, **characterized in that** the valve wall (22) is provided with four cuts (24).

8. A pump (1) according to any one of the preceding claims, **characterized in that** adjacent cuts of the cuts (24) include an at least substantially equal angle.

9. A pump (1) according to any one of the preceding claims, **characterized in that** the pump (1) is arranged as a metering pump for dispensing an amount of liquid in a metered manner upon an energization of the pump.

10. A pump (1) according to claim 9, **characterized in that** the pump (1) further comprises a cylinder chamber (6) and a plunger (8) which is accommodated in the cylinder chamber (6) for movement between a first position and a second position, the plunger (8) being connected to the outlet valve energization element (30), the liquid flow path of the pump (1) extending from the inlet (10) to the cylinder chamber (6) and from the cylinder chamber to the outlet nozzle (12), while for dispensing the pumped liquid contained in the cylinder chamber (6) in a metered manner, the plunger (8) is moved in a direction from the second position to the first position; upon movement of the plunger in the direction from the second position to the first position, the outlet valve energization element (30) causes the valve subwalls (32) to bend from the rest position, so that the outflow opening (20) is opened for dispensing the pumped liquid from the cylinder chamber (6); upon movement of the plunger in a direction from the first position to the second position, liquid is pumped via the inlet (10) to the cylinder chamber (6); and upon movement of the plunger from the first position to the second position, the outlet valve energization element (30) is moved back in the direction opposite to the downstream direction, so that the valve subwalls (32) spring back into the rest position and close the outflow opening (20) again.

11. A pump (1) according to claim 10, **characterized in that** the inlet (10) is in fluid communication with the cylinder chamber (6) via a first non-return valve (14), the first non-return valve allowing liquid to pass only in the downstream direction of the liquid flow path.

12. A pump (1) according to claim 10 or 11, **characterized in that** the cylinder chamber (6) is in fluid communication with the outlet nozzle (12) via a second non-return valve (16), the second non-return valve (16) allowing liquid to pass only in the downstream direction of the liquid flow path.

13. An outlet nozzle (12) for dispensing a liquid comprising an outflow opening (20) which includes an outlet valve (18), the outlet valve (18) being formed by a valve wall (22) made of a flexible material which, in a rest position, closes the outflow opening (20), the valve wall (22) comprising at least three cuts (24) provided in the configuration of a star, each extending from a common point (26) of the valve wall in a radial direction of the outflow opening, (20) **characterized in that** the nozzle further comprises a an outlet valve energization element (30) for pressing valve subwalls (32), formed between the cuts of the valve wall, from an inside (28) of the outlet nozzle adjacent to the valve wall (22) in a downstream direction of the outlet nozzle (12), so that said valve subwalls (32) are bent in the downstream direction and flow passages are formed at the cuts between the valve subwalls (32) for opening the outflow opening (20) for dispensing the liquid, while the valve subwalls (32) spring back to the rest position and close the outflow opening again when the outlet valve energization element (30) is moved back in a direction opposite to the downstream direction.

Patentansprüche

1. Pumpe (1) zum Ausgeben einer Flüssigkeit, welche einen Einlass (10) zum Pumpen der Flüssigkeit, eine Auslassdüse (12) und einen Flüssigkeits-Durchflussweg, welcher sich von dem Einlass (10) bis zur Auslassdüse (12) erstreckt und zum Ausgeben der gepumpten Flüssigkeit durch die Auslassdüse (12) dient, umfasst, wobei die Auslassdüse (12) eine Ablauföffnung (20) umfasst, welche ein Auslassventil (18) beinhaltet, wobei das Auslassventil (18) aus einer Ventilwand (22) gebildet ist, welche aus einem flexiblen Material besteht, und welches in einer Ruheposition die Ablauföffnung (20) schließt, wobei die Ventilwand (22) wenigstens drei Schlitze (24) umfasst, die wie ein Stern angeordnet sind und sich jeweils von einem gemeinsamen Punkt (26) der Ventilwand (22) in radialer Richtung von der Ablauföffnung (20) erstrecken, **dadurch gekennzeichnet, dass** die Pumpe (11) ferner ein Auslassventil-Erregerelement (30) umfasst zum Drücken von Ventilunterwänden (32), welche zwischen den Schlitzen (24) der Ventilwand (22) gebildet sind, von einer an die Ventilwand (22) angrenzenden Innenseite (28) der Auslassdüse (12) in einer von der Auslassdüse (12) stromabwärts gerichteten Richtung, so dass die Ventilunterwände (32) in die stromabwärts gerichtete Richtung gebogen werden und an den Schlitzen zwischen den Ventilunterwänden (32) Fließdurchgänge gebildet werden zum Öffnen der Abflussöffnung (20) zum Ausgeben der gepumpten Flüssigkeit, während die Ventilunterwände (32) in die Ruheposition zurückfedern und die Ablauföffnung (20) wieder schließen, wenn Auslassventil-Erregerelement (30) in einer der stromabwärts gerichteten Richtung entgegengesetzten Richtung zurückbewegt wird.

2. Pumpe (1) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Ventilwand (22) in ihrer Ruheposition eine runde Oberfläche an der an die Ventilwand (22) angrenzenden Innenseite (28) der Auslassdüse (12) aufweist.

3. Pumpe (1) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die an die Schlitze (24) angrenzenden Ränder der Ventilunterwände (32) in ihrer Ruheposition gegeneinander angeordnet sind.

4. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** der gemeinsame Punkt (26) zumindest im wesentlichen im Schwerpunkt der Ventilwand (22) liegt.

5. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Ventilwand (22) zumindest im wesentlichen senkrecht zu einer Fließrichtung an der Ablauföffnung (20) des sich durch die Ablauföffnung (20) erstrekkenden Flüssigkeits-Durchflusswegs gerichtet ist.

6. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Pumpe ferner Vorrichtungen zum Bewegen des Auslassventil-Erregerelementes (30) in eine stromabwärts gerichtete Richtung aufweist, wenn die Pumpe (1) zum Ausgeben von Flüssigkeit erregt wird.

7. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Ventilwand (22) mit vier Schlitzen (24) ausgestattet ist.

8. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die benachbarten Schlitze der Schlitze (24) einen zumindest im wesentlichen gleichen Winkel haben.

9. Pumpe (1) gemäß irgendeinem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Pumpe (1) als eine Dosierpumpe zum Ausgeben einer Flüssigkeitsmenge in einer dosierten Weise bei einer Erregung der Pumpe vorgesehen ist.

10. Pumpe (1) gemäß Anspruch 9, **dadurch gekennzeichnet, dass** die Pumpe (1) weiter eine Zylinderkammer (6) und einen Kolben (8) umfasst, welcher in der Zylinderkammer (6) zum Bewegen zwischen einer ersten Position und einer zweiten Position gelagert ist, wobei der Kolben (8) mit dem Auslassventil-Erregerelement (30) verbunden ist, sich der Flüssigkeits-Durchflussweg der Pumpe (1) von dem Einlass (10) zur Zylinderkammer (6) und von der Zylinderkammer zur Auslassdüse (12) erstreckt, während zum dosierten Ausgeben der in der Zylinderkammer (6) beinhalteten gepumpten Flüssigkeit der Kolben (8) in einer Richtung von der zweiten Position zu der ersten Position bewegt wird; bei Bewegung des Kolbens in einer Richtung von der zweiten Position zu der ersten Position verursacht das Auslassventil-Erregerelement (30) ein Beugen der Ventilunterwände (32) aus der Ruheposition, so dass die Ablauföffnung (20) zum Ausgeben der gepumpten Flüssigkeit aus der Zylinderkammer (6) geöffnet wird; bei Bewegung des Kolbens in einer Richtung von der ersten Position zu der zweiten Position wird Flüssigkeit durch den Einlass (10) in die Zylinderkammer (6) gepumpt; und bei Bewegung des Kolbens von der ersten Position zu der zweiten Position wird das Auslassventil-Erregerelement (30) in einer der stromabwärts gerichteten Richtung entgegengesetzten Richtung zurückbewegt, so dass die Ventilunterwände (32) in die Ruheposition zurückfedern und die Ablauföffnung (20) wieder

schließen.

11. Pumpe (1) gemäß Anspruch 10, **dadurch gekennzeichnet dass** der Einlass (10) in Fließverbindung mit der Zylinderkammer (6) steht mittels einem ersten Einweg-Ventil (14), wobei das erst Einweg-Ventil ein Passieren der Flüssigkeit nur in eine stromabwärts gerichtete Richtung des Flüssigkeits-Durchflusswegs erlaubt.

12. Pumpe (1) gemäß Anspruch 10 oder 11, **dadurch gekennzeichnet, dass** die Zylinderkammer (6) in Fließverbindung mit der Auslassdüse (12) steht mittels einem zweiten Einweg-Ventil (16), wobei das zweite Einweg-Ventil (16) ein Passieren der Flüssigkeit nur in eine stromabwärts gerichtete Richtung des Flüssigkeits-Durchflusswegs erlaubt.

13. Auslassdüse (12) zum Ausgeben von Flüssigkeit mit einer Ablauföffnung (20), welche ein Auslassventil (18) umfasst, wobei das Auslassventil (18) aus einer Ventilwand (22) gebildet ist, welche aus einem flexiblen Material besteht, und welches in einer Ruheposition die Ablauföffnung (20) schließt, wobei die Ventilwand (22) wenigstens drei Schlitze (24) umfasst, die wie ein Stern angeordnet sind und sich jeweils von einem gemeinsamen Punkt (26) der Ventilwand in radialer Richtung von der Ablauföffnung (20) erstrecken, **dadurch gekennzeichnet, dass** die Düse ferner ein Auslassventil-Erregerelement (30) umfasst zum Drükken von Ventilunterwänden (32), welche zwischen den Schlitzen (24) der Ventilwand gebildet sind, von einer an die Ventilwand (22) angrenzenden Innenseite (28) der Auslassdüse in einer stromabwärts gerichteten Richtung von der Auslassdüse (12), so dass die Ventilunterwände (32) in die stromabwärts gerichtete Richtung gebogen werden und Fließdurchgänge gebildet werden an den Schlitzen zwischen den Ventilunterwänden (32) zum Öffnen der Abflussöffnung (20) zum Ausgeben der Flüssigkeit, während die Ventilunterwände (32) in die Ruheposition zurückfedern und die Ablauföffnung (20) wieder schließen, wenn Auslassventil-Erregerelement (30) in einer der stromabwärts gerichteten Richtung entgegengesetzten Richtung zurückbewegt wird.

Revendications

1. Pompe (1) de fourniture de liquide, comprenant un orifice d'entrée (10) pour pomper le liquide, une buse de sortie (12) et un trajet d'écoulement du liquide s'étendant de l'orifice d'entrée (10) à la buse de sortie (12) pour fournir le liquide pompé via la buse de sortie (12), dans laquelle la buse de sortie (12) comprend une ouverture de sortie (20) qui comporte une soupape de sortie (18), la soupape de sortie (18) étant constituée par une paroi de soupape (22) en matériau flexible qui, dans une position de repos, ferme l'ouverture de sortie (20), la paroi de soupape (22) comprenant au moins trois entailles (24) disposées selon la configuration d'une étoile, chacune s'étendant depuis un point commun (26) de la paroi de soupape (22) dans une direction radiale de l'ouverture de sortie (20), **caractérisée par le fait que** la pompe (11) comprend en outre un élément (30) d'activation de la soupape de sortie pour presser des sous-parois de soupape (32), formées entre les entailles (24) de la paroi de soupape (22), depuis une partie intérieure (28) de la buse de sortie (12) adjacente à la paroi de soupape (22) dans une direction aval de la buse de sortie (12), de sorte que les sous-parois de soupape (32) sont courbées dans la direction aval et, aux entailles entre les sous-parois de soupape (32), des passages de flux sont formés pour ouvrir l'ouverture de sortie (20) pour fournir le liquide pompé, alors que les sous-parois de soupape (32) reviennent élastiquement à la position de repos et referment l'ouverture de sortie (20) lorsque l'élément (30) d'activation de la soupape de sortie revient dans une direction opposée à la direction aval.

2. Pompe (1) selon la revendication 1, **caractérisée par le fait que** la paroi de soupape (22) dans la position de repos présente une surface arrondie sur la partie intérieure (28) de la buse de sortie (12) adjacente à la paroi de soupape (22).

3. Pompe (1) selon l'une des revendications 1 et 2, **caractérisée par le fait que** des bords des sous-parois de soupape (32) adjacents aux entailles (24) sont disposés l'un contre l'autre dans la position de repos.

4. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** le point commun (26) est situé au moins sensiblement au centre de gravité de la paroi de soupape (22).

5. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** la paroi de soupape (22) est dirigée au moins sensiblement perpendiculairement à une direction d'écoulement à l'ouverture de sortie (20) du trajet d'écoulement de liquide s'étendant à travers l'ouverture de sortie (20).

6. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** la pompe comprend en outre un moyen de déplacement de l'élément (30) d'activation de la soupape de sortie en direction aval lorsque la pompe (1) est activée pour fournir le liquide.

7. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** la paroi de soupape (22) comporte quatre entailles (24).

8. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** des entailles adjacentes parmi les entailles (24) délimitent un angle au moins-sensiblement égal.

9. Pompe (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** la pompe (1) est agencée sous forme de pompe de mesure pour fournir une quantité de liquide de façon mesurée suite à une activation de la pompe.

10. Pompe (1) selon la revendication 9, **caractérisée par le fait que** la pompe (1) comprend en outre une chambre pour piston (6) et un piston (8) qui est logé dans la chambre pour piston (6) pour se déplacer entre des première et seconde positions, le piston (8) étant relié à l'élément (30) d'activation de la soupape de sortie, le trajet d'écoulement de liquide de la pompe (1) s'étendant depuis l'orifice d'entrée (10) jusqu'à la chambre pour piston (6) et de la chambre pour piston à la buse de sortie (12), alors que pour fournir le liquide pompé contenu dans la chambre pour piston (6) de façon mesurée, le piston (8) est déplacé dans une direction à partir de la seconde position vers la première position ; par le mouvement du piston, dans la direction allant de la première position à la seconde position, l'élément (30) d'activation de la soupape de sortie provoque la courbure des sous-parois de soupape (32) depuis la position de repos, de sorte que l'ouverture de sortie (20) est ouverte pour fournir le liquide pompé depuis la chambre pour piston (6) ; par le mouvement du piston dans une direction allant de la première position à la seconde position, du liquide est pompé via l'orifice d'entrée (10) dans la chambre pour piston (6) ; et par mouvement du piston de la première position à la seconde position, l'élément (30) d'activation de la soupape de sortie revient en arrière dans la direction opposée à la direction aval, de sorte que les sous-parois de soupape (32) reviennent élastiquement dans la position de repos et referment l'ouverture de sortie (20).

11. Pompe (1) selon la revendication 10, **caractérisée par le fait que** l'orifice d'entrée (10) est en communication de fluide avec la chambre pour piston (6) via une première soupape anti-retour (14), la première soupape anti-retour permettant au liquide de ne passer que dans la direction aval du trajet d'écoulement du liquide.

12. Pompe (1) selon l'une des revendications 10 et 11, **caractérisée par le fait que** la chambre pour piston (6) est en communication de fluide avec la buse de sortie (12) via une seconde soupape anti-retour (16), la seconde soupape anti-retour (16) permettant au liquide de ne passer que dans la direction aval du trajet d'écoulement du liquide.

13. Buse de sortie (12) de fourniture d'un liquide comprenant une ouverture de sortie (20) qui comporte une soupape de sortie (18), la soupape de sortie (18) étant constituée par une paroi de soupape (22) en matériau flexible qui, dans une position de repos, ferme l'ouverture de sortie (20), la paroi de soupape (22) comprenant au moins trois entailles (24) disposées selon la configuration d'une étoile, chacune s'étendant depuis un point commun (26) de la paroi de soupape dans une direction radiale de l'ouverture de sortie (20), **caractérisée par le fait que** la buse comprend en outre un élément (30) d'activation de la soupape de sortie pour presser des sous-parois de soupape (32), formées entre les entailles (24) de la paroi de soupape, depuis une partie intérieure (28) de la buse de sortie adjacente à la paroi de soupape (22) dans une direction aval de la buse de sortie (12), de sorte que les sous-parois de soupape (32) sont courbées dans la direction aval et des passages de flux sont formés, aux entailles entre les sous-parois de soupape (32), pour ouvrir l'ouverture de sortie (20) pour fournir le liquide, alors que les sous-parois de soupape (32) reviennent élastiquement à la position de repos et referment l'ouverture de sortie lorsque l'élément (30) d'activation de la soupape de sortie revient dans une direction opposée à la direction aval.

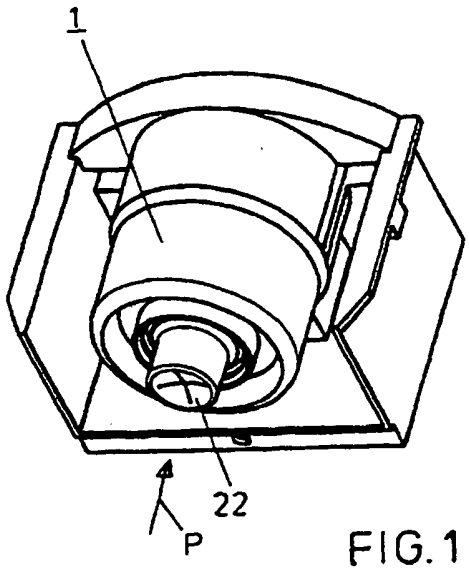

FIG. 1

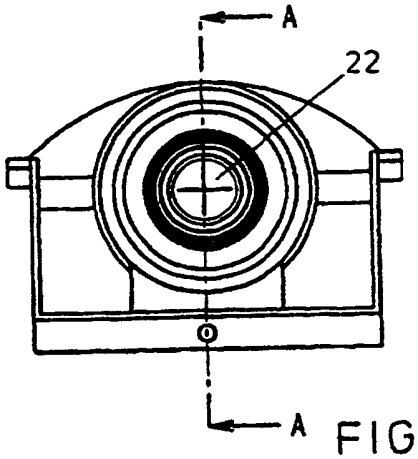

FIG. 2

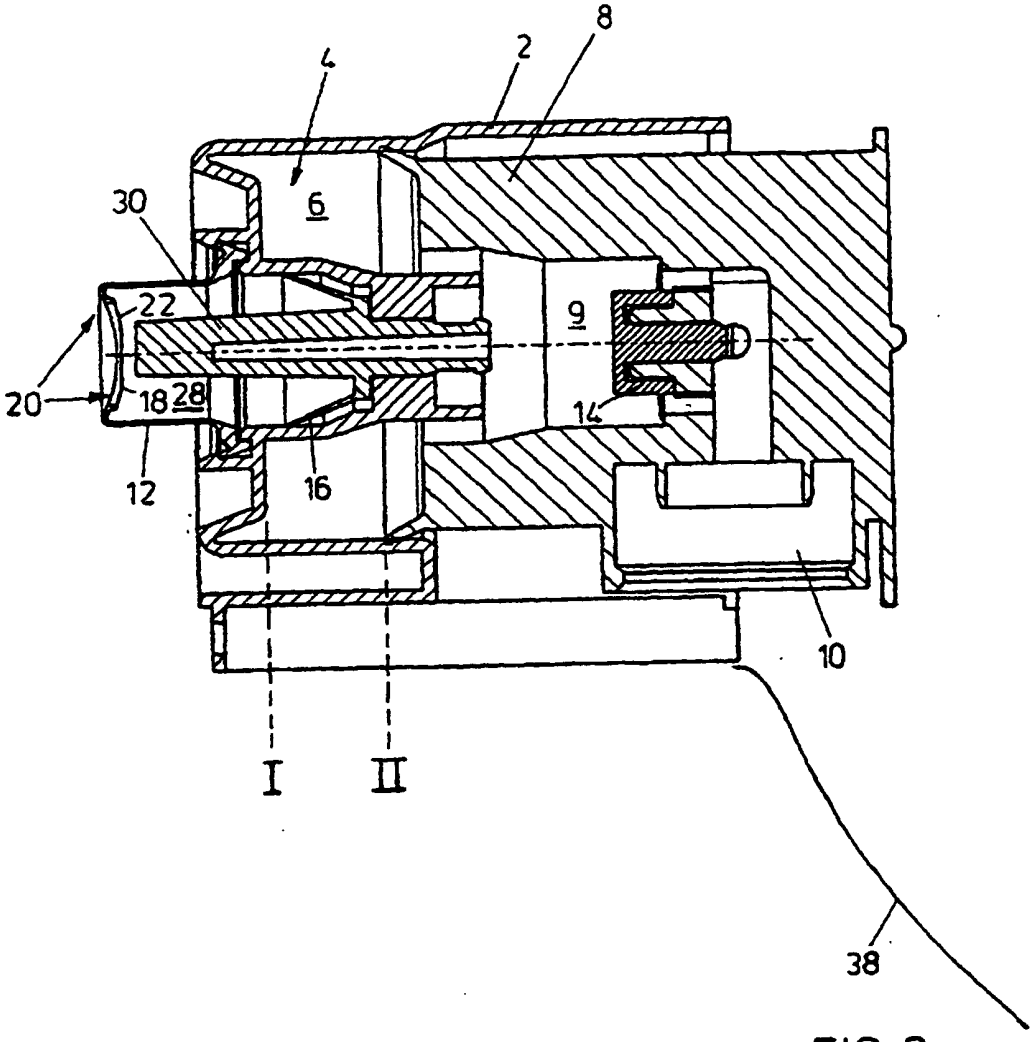

FIG. 3

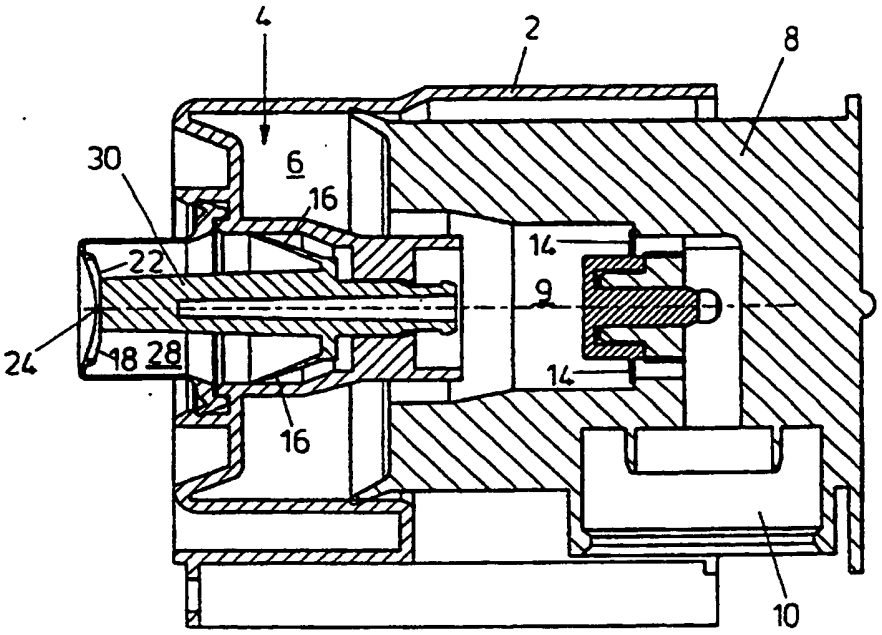

FIG. 4

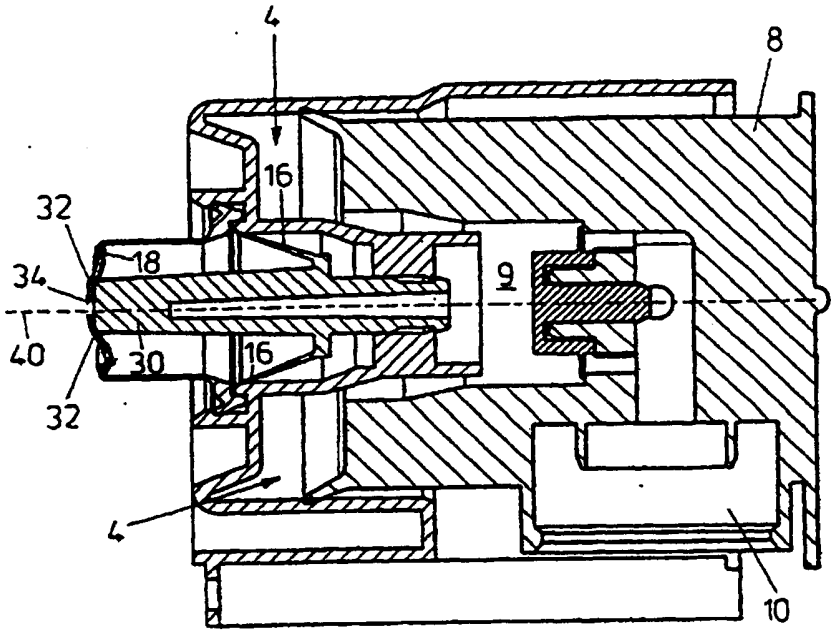

FIG. 5

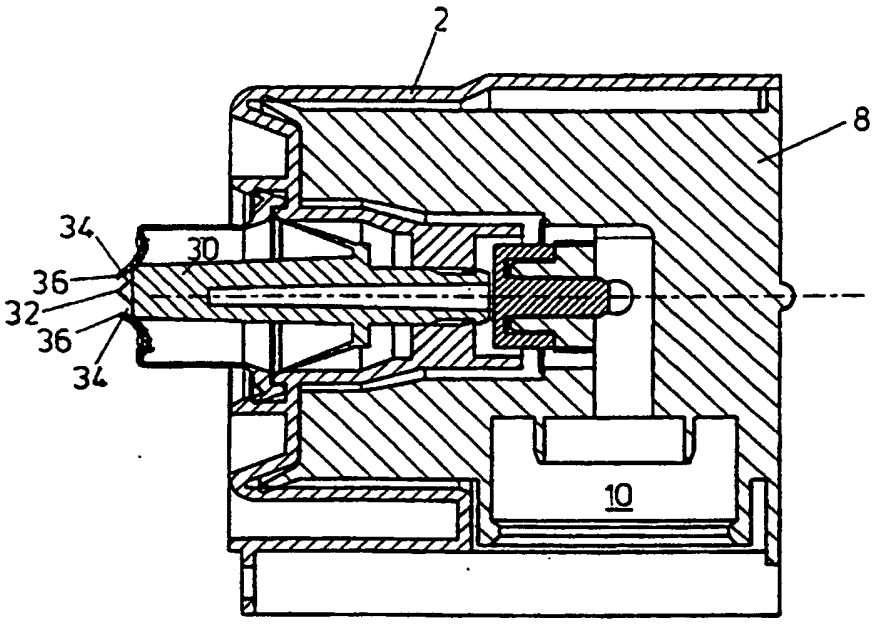

FIG. 6

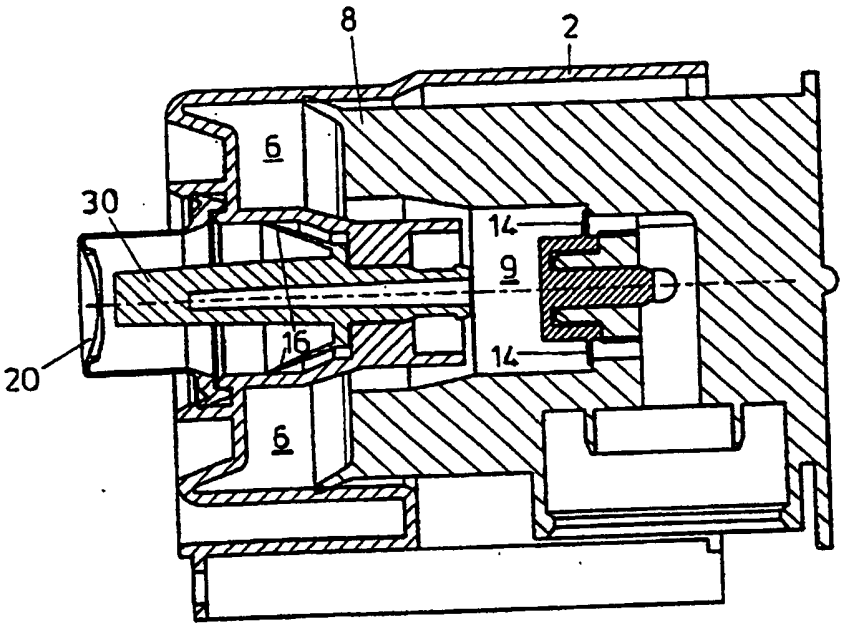

FIG. 7

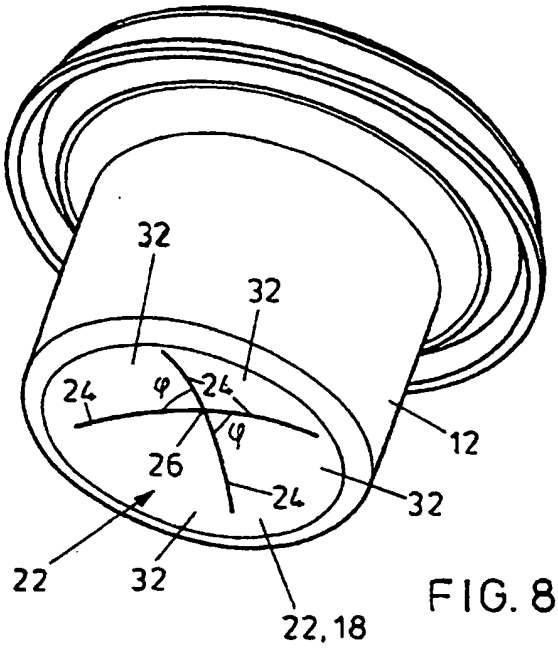

FIG. 8

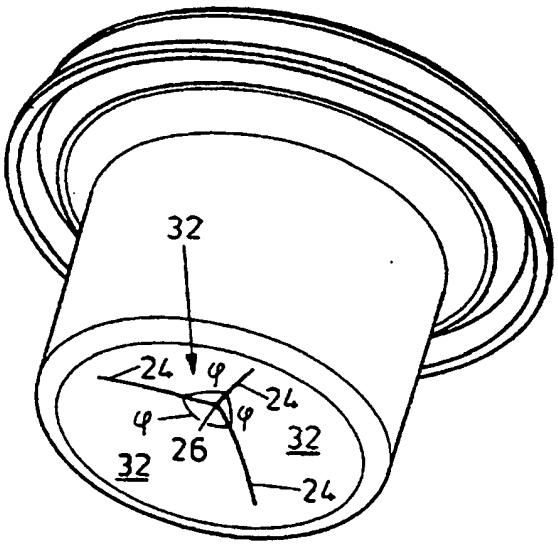

FIG. 9

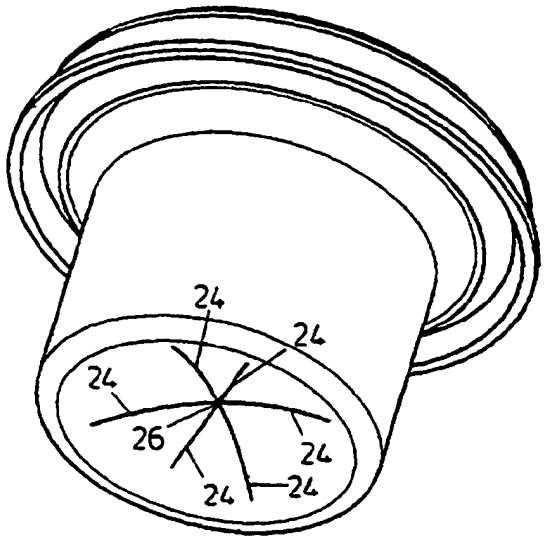

FIG. 10

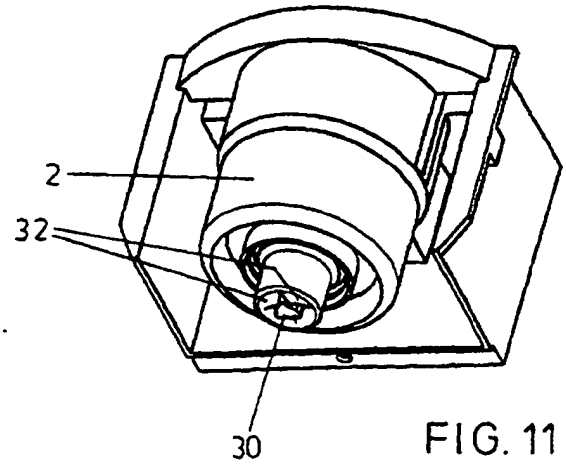

FIG. 11